

# Memoirs of the Geological Survey.

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## EXPLANATORY MEMOIR

TO ACCOMPANY

SHEET 45 OF THE MAPS

OF THE

## GEOLOGICAL SURVEY OF IRELAND,

INCLUDING

THE COUNTRY AROUND ENNISKILLEN, FIVEMILETOWN,  
TRILLICK, LISBELLAW, AND MAGUIRESBRIDGE,

IN THE COUNTIES OF

FERMANAGH AND TYRONE,

BY

S. B. WILKINSON AND J. R. KILROE,

WITH

PALÆONTOLOGICAL NOTES BY W. H. BAILY, F.G.S.

*Published by Order of the Lords Commissioners of Her Majesty's Treasury.*

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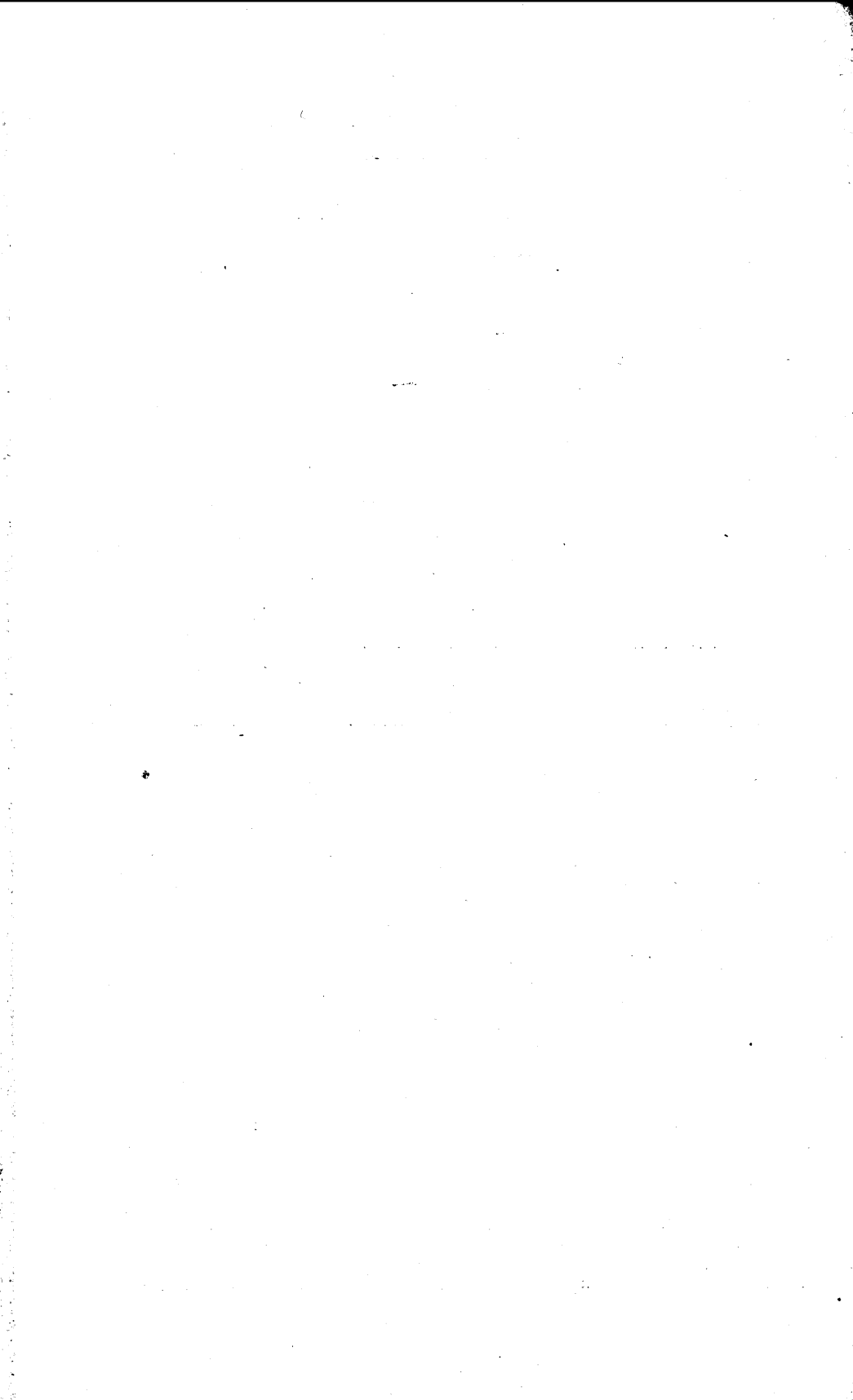
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The observations made in the course of the Geological Survey, are entered, in the first instance, on the Maps of the Ordnance Townland Survey, which are on the scale of six inches to the mile. By means of marks, writing, and colours, the nature, extent, direction, and geological formation of all portions of rock visible at the surface are laid down on these maps, which are preserved as data maps and geological records in the office in Dublin.

The results of the Survey are published by means of coloured copies of the one-inch map of the Ordnance Survey, accompanied by printed explanations.

Longitudinal sections, on the scale of six inches to the mile, and vertical sections of coal-pits, &c., on the scale of forty feet to the inch, are also published, and in preparation.

Condensed memoirs on particular districts will also eventually appear.

The heights mentioned in these explanations are all taken from the Ordnance Maps.

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## P R E F A C E .

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THIS Sheet was surveyed during portions of the years 1878-80; the western side by Mr. Wilkinson, and the eastern by Mr. Kilroe, and inspected by me on several occasions during the progress of the Survey. It contains representatives of the Lower and Upper Silurian Beds, "the Dingle Beds" (or "Lower Old Red Sandstone"), and several divisions of the Lower Carboniferous Series. The details have been ably worked out in the field, and laid down on the Map by the officers of the Survey above mentioned, and, with the aid of this descriptive Memoir, can be easily understood.

EDWARD HULL,

*Director.*

*7th January, 1882.*

# EXPLANATORY MEMOIR

TO ACCOMPANY

SHEET 45 OF THE MAPS

OF THE

## GEOLOGICAL SURVEY OF IRELAND.

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### GENERAL DESCRIPTION.

The area about to be described is bounded on the north by a line passing through Necarne Castle, on the east by one about two miles east of Fivemiletown, on the south by one immediately south of Maguiresbridge, and on the west by Lough Erne. The chief town is Enniskillen; there are also the towns of Maguiresbridge, Fivemiletown, Brookeborough, and Trillick, and the villages of Lisbellaw, Ballinamallard, and Tempo.

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### PHYSICAL GEOGRAPHY.

#### *Western Part.*

The area included in this part of sheet 45, viz., the western half of the sheet, is drained by two small streams, which have their source on the north and south slopes of Brocker Mountain.

The Ballinamallard river drains the northern slope, and runs through the Trillick valley, on to Ballinamallard, thence to Ballycassidy, where it discharges itself into Lower Lough Erne. The Tempo river drains the southern slope of Brocker Mountain, passing through the village of Tempo, working its way nearly due south a short distance west of Maguiresbridge, and soon leaves the sheet, eventually reaching Upper Lough Erne.

The highest points along this small watershed are on the ridge formed by the Brocker Mountain (1,046 feet), and Thornoge (898 feet). The boundary between the counties Tyrone and Fermanagh runs along the watershed line.

Brocker, Thornoge, and Topped Mountain (909 feet), are the highest points in this part of the country.

From Topped Mountain, which lies four miles east of the town of Enniskillen, an extensive view of Upper and Lower Loughs Erne can be obtained, and the mountains of Belmore, Cuilcagh, and Knockninny.

The limestone escarpments can be easily traced on Belmore and Knockninny, and at the base of Cuilcagh along the valleys of Lough Macnean and Swanlinbar.

S. B. W.

## PHYSICAL GEOGRAPHY

*Eastern Half.*

The high ground in the north of the sheet, striking eastward from Bocker (1,046), and that stretching east from Brookeborough on the south, culminating in Teige's Mountain (879), and Jenkin Hill (974), include between them a valley running E.N.E., in which are situated Fivemiletown, Clogher, and Augher.

The watershed passing along the summit of Bocker Mountain crosses Glengesh (through which the road runs, connecting Tempo with Fintona), near where the counties join, rises to the summit of Tattymoyle Hill (1,032), and thence runs south-eastward to Ballyness Mountain (958), throwing off streams to the north, the principal of which is Glennamuck River. The streams thrown off on the south have a uniform direction, and unite to form the Blackwater which flows eastward, and the Manyburns and Tempo Rivers, tributaries of the Colebrooke. The streams are all of small magnitude, because of the proximity and parallelism of the watershed to the mountain foot, running by Clabby, Murley, and Aghintain; and, as a consequence, the slope is not cut up and varied on the north, as is the case on the south of the sheet. Here the ground is highly varied. Streams of greater or less magnitude flow in many directions; the Glenoo River, and its tributary streams, sculpturing the Cooneen valley; the "Cooneen Water" forming Donaghmore Glen, &c. These streams unite to form the Colebrooke river, which flows by Colebrooke, and Ashbrooke, and thence south-westward by Maguiresbridge, where it leaves the sheet.

J. R. K.

FORMATIONS AND GROUPS OF ROCKS ENTERING INTO THE  
STRUCTURE OF THE DISTRICT.

*Aqueous Rocks.*

| Age.                              |  | Colour on Map.                          |
|-----------------------------------|--|---|
| Recent and Post<br>Glacial, . . . | } Alluvium and Peat (bog), . .                                 | <i>Pale Sepia.</i>                      |
| Post Pliocene<br>or Drift, . . .  |  |   |
|                                   | } Boulder Clay, and Gravel . . .                               | <i>Engraved dots.</i>                   |
|                                   |  |   |
| Carboniferous<br>Series, . . .    | d <sup>3</sup> Yoredale Sandstone, . . .                       | <i>Yellow and Red dots.</i>             |
|                                   | d <sup>3</sup> Yoredale Shale, . . .                           | <i>Indigo and Indian ink.</i>           |
|                                   | d <sup>1'''</sup> Upper Limestone, . . .                       | <i>Deep Prussian blue.</i>              |
|                                   | d <sup>2''</sup> Middle Limestone ("Calp") . . .               | <i>Indigo.</i>                          |
|                                   | d <sup>2'</sup> Lower Limestone, . . .                         | <i>Pale Prussian blue.</i>              |
|                                   | d' Lower Carboniferous Shale, . . .                            | <i>Prussian blue and Indian ink.</i>    |
|                                   | d' Lower Carboniferous Sandstone, . . .                        | <i>Prussian blue, with yellow dots.</i> |
|                                   | b <sup>6</sup> "Lower Old Red Sandstone," (Dingle Beds), . . . | <i>Purple and Indian red.</i>           |

|                   |   |                       |
|-------------------|---|-----------------------|
| Upper Silurian, . | { b <sup>s</sup> Upper Llandovery, with | } <i>Dark purple.</i> |
|                   | conglomerates, . . .                    |                       |
| Lower „ .         | b' Llandeilo Slates, . . .              | <i>Light purple.</i>  |

### *Igneous Rocks.*

|                               | Colour on Map            |
|-------------------------------|--------------------------|
| B. Dolerite and Basalt, . . . | <i>Burni carmine</i>     |
| D. Diorite, . . . . .         | <i>Do.</i>               |
| F. Felstone, . . . . .        | <i>Light vermillion.</i> |

### LOWER PALÆOZOIC FORMATIONS.

#### *Lower Silurian Beds.*

At Three Jump Hill, a little to the north-west of Lisbellaw, the slates are well opened out in the slate-quarry. They consist of pale greenish-gray slates and tile stones, apparently not cleaved, dipping at a high angle, or vertically contorted.

In the railway cutting east of first bridge (going towards Enniskillen) they are also open to view, here they appear as hard splintery variegated red and green shales dipping at a very high angle or almost vertical, the strike being N.E and S.W.

Along the railway at Lisbellaw station, reddish or green shales are seen disturbed by a small fault, and having beds of grit and conglomerate lying on them. A little further to the east another small break occurs; the beds here are much contorted, and dip in all directions from 15° to 60°; they are the same variegated slates, with a few beds of grit, which are rather peculiar in the way in which the quartz pebbles are scattered, appearing like grains of rice.

Two hundred yards to the north course greenish grits and decomposed shales and slates are seen dipping at high angle, to the north-west; a few hundred yards further north-east in the stream running from Slieve Hill to Ashfield, the rocks appear dipping at a high angle north-west sometimes as much as 80°; they are generally highly quartzose conglomerates and grits, with a few bands of shale which generally appear contorted.

These conglomerates, although being in places massively bedded, differ altogether from the enormous massiveness of the beds of the Upper Silurian.

The boundary both north as well as south is a fault the southern one traced for a considerable distance.

S. B. W.

#### *Upper Silurian Beds.*

At Lisbellaw, a small village four miles south-east of Enniskillen, these rocks are well seen, consisting of massive conglomerates, with a general southerly dip. They are probably the representation of the Llandovery beds. The pebbles of the con-

glomerate are principally quartzite of a purple and grey colour, but granite, diorite, and felsstone-porphry pebbles are numerous; there is also a large boulder of granite, with red felspar, probably derived from Donegal.

Fig. 1.

Section through Lisbellaw to illustrate the succession and the relations of the formations.



These boulders and pebbles vary in size from that of a man's head down to that of a marble, they are well rounded.\* The dip is S. or S.S.E. and about 30°.

These rocks are seen at the village where they dip S.S.E. at 30°, and a few hundred yards on the road side leading south from Lisbellaw massive grits occur with undefined dip. They are also to be seen on the N. of the road running to Tempo, about 300 yards from the village, here they still retain the very massive character noticed at Lisbellaw.

## LOWER OLD RED SANDSTONE (DINGLE BEDS).†

### *Western Part.*

The south-eastern boundary of these beds can be traced from the valley of the Tempo river, through Tempo, passing a little to the north of Lough Eyes, and on to Tamlaght Church, where it joins its south-western boundary. Running in a rather waving line and crossing the railway north-east of Castle Coole demesne, it continues in a north-westerly direction, and again crosses the railway north of Enniskillen, and skirts the eastern shore of Drumgay Lough, on to Ballycasidy bridge and Rosfad House, where it leaves this sheet.

\* Portlock, in his "Report on Londonderry, and parts of Tyrone and Fermanagh," writing of these rocks, says that "they contain a great quantity of primary or igneous pebbles, some of which so closely resemble the rocks of Slieve Gallion, that they may be assumed to have come from that quarter."

† The rocks here described are marked on Griffith's Geological Map of Ireland (1855), "Old Red Sandstone," and in all probability they are the representatives of the so-called "Lower Old Red Sandstone" of Scotland. On the other hand, the probabilities are that they represent also the great group of rocks in the south of Ireland, known as "The Dingle Beds," or "Glengariff Grits and Slates" (Jukes), which are seen in the Dingle coast-section to pass downwards gradually into the Upper Silurian beds. From the comparison which I have recently made with sections in Devonshire and other parts of England, I have come to the conclusion that the Dingle Beds lie on the confines of the Upper Silurian series on the one hand, and of the Lower Devonian, on the other (Trans. Roy. Dub. Society, New Ser., Vol. I., p. 1852); and if we were to adopt a new name, might be called "Devono-Silurian," as they form the connecting link between the two great groups of the Devonian above and the Silurian below. The old name is here provisionally retained to avoid misunderstanding.—E. H.



These beds are probably unconformable to both Upper and Lower Silurian.

The beds nearest the Silurian boundary are generally softish red and purple sandstones, grits, and fine conglomerates. Under the second railway bridge after leaving Lisbellaw, in the direction of Enniskillen, in the cutting there are beds of conglomerate weathering rapidly, leaving bands of soft red sandstone with little specs of mica, the pebbles of quartz and quartzite being weathered out; the beds here are horizontal with an inclination to dip W. This description applies to the rocks in this neighbourhood, but on going further into the formation the beds become very much changed; they are well seen on the high ground of Topped (909 feet), Creaghnamoney hill (842 feet), and along the Brocker (1,046 feet) ridge.

The dip is steady north-west, and at an average of 10°.

What directly catches the eye is the peculiar felspathic ash-like appearance of the conglomerates.

Portlock, page 505, "Report of Londonderry, &c.," mentions this peculiar appearance:—

... "The sandstones and conglomerates which occur along the principal culminating ridge, are highly felspathic, the felspar being in very minute crystals, and the paste generally so very fine, that some specimens might be taken for a compound crystalline rock. It is not therefore surprising that it should pass readily into porphyries.

"The rocks of Brocker are good examples of the hard felspathic sandstone.

"The conglomerates of the older division contain primary pebbles, some of which appear to have suffered change, and where the paste has assumed a homogeneous or porphyritic aspect, the rock has often a slag-like appearance which is very remarkable."

The beds in the neighbourhood of Tempo are more flaggy evenly bedded, and softer, and dip under the felspathic conglomerates of Brocker.

These beds extend over a large area to the north-west, and retain the same appearance throughout. Occasionally there appears to be a band of less felspathic sandstone and conglomerate, such as that seen in the Ballinamallard river between the village and Bundoran Junction, where there are purple and red rather shaley sandstones, and north of Tullyrain bridge red sandstones with shale bands.

Some of the conglomerates are variegated and mottled; in some instances the colours being brilliant or strongly marked.

S. B. W.

East of Brocker the formation consists of a series of brown or purple pebbly grits, and conglomerates, with pebbles, which, in the Glennamuck River at Dromore Lower, are found up to 8 inches in diameter, of greenish grey and brown grit, quartzite and felstone; and red shales, which are more or less arenaceous and indurated, and sometimes calcareous, often mottled with green patches usually calcareous. A considerable thickness of massive and flaggy pinkish brown sandstone occurs in the western area of

this (the eastern) half of the sheet, dipping under purplish sandy conglomerate near the summit of Brocker Mountain. Rain drop pittings and "sun cracks" have been noticed in purple mottled shale in Dromore Lower, N.E. corner.

J. R. K.

#### LOWER CARBONIFEROUS SANDSTONE AND SHALE.

##### *South and West.*

There are only two exposures of the Lower Carboniferous sandstone, both occurring close to Lough Gola about two miles due south of Lisbellaw, and on the southern margin of the sheet, in both cases blue shales and thin bands of limestone rest on fine-grained yellow quartzose sandstone; the beds to the west of Lough Gola are almost horizontal, with an inclination to dip west, while the beds in the quarry north-east of the lough, are at somewhat a higher angle, dipping  $10^{\circ}$  north-west, probably owing to a slight disturbance caused by the fault which runs down the Lough Eyes valley.

It is uncertain work drawing a boundary between these rocks and the Lower Carboniferous Shales, as the country when not of an alluvial deposit, is covered by boulder clay drift. There is nothing more to be seen of these sandstones owing to the causes just mentioned, but they are probably of very little thickness here

#### LOWER CARBONIFEROUS SHALE.

The above mentioned difficulty of drawing the boundary applies to the Lower Carboniferous shale also. The only place where there is any sign now is on the railway about half a mile east of Enniskillen railway station, but while the Sligo and Leitrim line was in course of construction a large quarry was opened, where the beds could be seen to great advantage, but it has since been filled in. They consist of rotten argillaceous blue and black shales and slates, highly fossiliferous, and dipping at a low angle under the Lower Carboniferous Limestone.

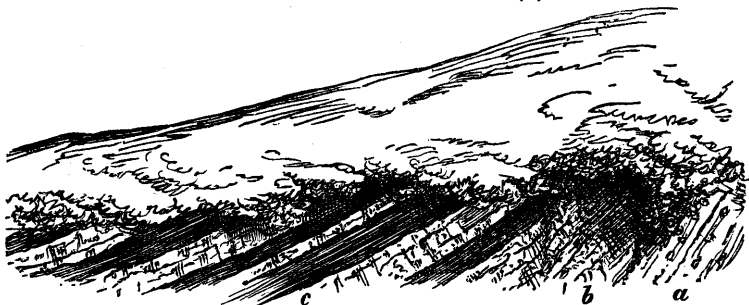
S. B. W.

These beds are largely developed north of Clabby and Aghintain, resting unconformably upon the "Dingle Beds" just described, and faulted up against the higher beds along the mountain foot. They may be seen at Lendrum's and Donaghey's bridges; also in the streams north and west of the latter point, which lay open sections by means of which the northern and western limits of the beds under description may be determined.

The basal beds near the sheet margin consist of conglomerates with intercalated beds of gray calcareous fissile sandstone, weathering quite soft, which here and elsewhere shows false bedding. The conglomerates are formed of pebbles of pink and brown felsite and felsite, gray, greenish, and pink quartzite with and without mica, numerous small pebbles of green grit, white quartz, porphyry, jasper, local rocks and other varieties, all are embedded in gray, sandy calcareous matter, usually soft, or cemented by calcite; the pebbles are well rounded. So easily

eroded are these beds that the streams almost everywhere form deep cuttings through them, as is the case in those flowing from Tattymoyle Hill, in the Manyburns, the streams north of Murley, and at Aghintain. At the three last mentioned points, the beds, though doubtless higher in position than those above described, are of the same general character, but there is a marked prevalence of quartzite pebbles which in Aghintain burn, near the Castle, are found up to seven inches in diameter, and an abundance of small flat rounded pebbles of greenish (chloritic?) grit. The lowest visible beds in Ballyness (Aghintain) section, consist of coarse-grained pinkish laminated grit, under soft pink sandstones with white quartz pebbles; followed by red arenaceous shale, under purple, gray and red sandstones, which are sometimes banded with green shale. Almost all the beds are highly calcareous, and weather so rapidly that the high banks of the streams washing the mountain slopes, have in several places the appearance of stratified sand and gravel with rounded blocks, quite incoherent. A bed of pure white calcite about seven inches thick, and a few yards long, is displayed in section in a bank of Ballyness burn near Aghintain Castle. False bedding, already mentioned, is characteristic of the formation.

These beds are called Upper Old Red Sandstone by Portlock, and are indicated as such on his map. Griffith coloured them\* as "yellow sandstone" (part of the Carboniferous system) on his map issued in 1837, but transferred them to his Devonian system on the edition issued in 1855. Now, however, these and similar beds at Draperstown, Dungiven, &c., are believed to correspond to the calciferous series in Scotland, which belong to the Carboniferous† system; and they are treated as such in this district, being conformable to undoubted Carboniferous beds. This is evident in a good section met with near Cole Bridge, two and a half miles north of Fivemiletown, where the beds above described pass upward without a break through beds of typical Lower Carboniferous grits, containing white quartz pebbles. The yellow grit is also seen as fault rock in the section which the accompanying sketch is intended to illustrate, see Section (2).



Section (2) in Tattanafinnell burn.

a. Quartzose Conglomerate. b. Yellow grit (fault rock). c. Shale and Arenaceous Limestone.

\* "Report on Londonderry and Tyrone" pp. 65-70.

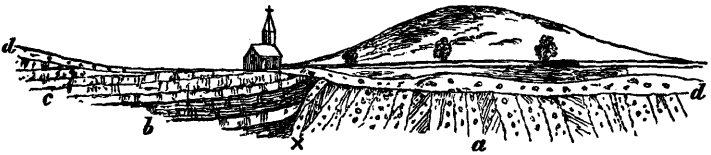
† *Vide* paper by J. Nolan "On the Old Red Sandstone of the north of Ireland."—*Quar. Jour. Geo. Soc.*, p. 580.

The section shows a series of alternating beds of black shale (sometimes pyritous), dark grey limestone, calcareous sandstone, &c. The limestone beds here and on the same horizon at the county boundary in Killygordan contain encrinurites, *Zaphrentis*, &c.

A mile and a half N. of Fivemiletown, on the roadside, a quarry has been opened on dark grey earthy limestone, weathering quite shaley; it is now abandoned. In Tullyullagh, near Tempo, the Manyburns lays open a section through rock very similar to that just described, containing fossils.

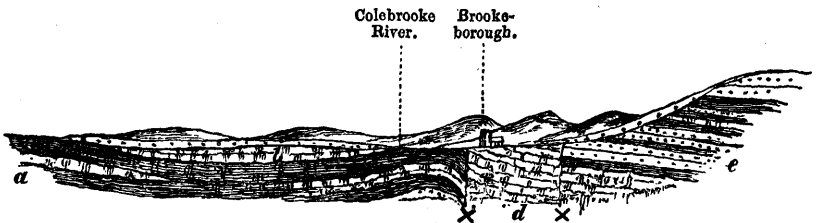
Several openings on the shales are met with east of Clabby; and in a stream flowing through that village, is seen a fault throwing the pure blue lower limestone down almost against the quartzite conglomerates, all but cutting out the shales, as illustrated in the sketch (3). On the southern outcrop of the shales indicated on the map, they appear at the head of Corralongford Lough on the road side; also in the river, half a mile S.E. of Kiltermon Church, where is found thin-bedded earthy limestone, weathering quite shaley. The shales re-appear in a small outcrop near Maguiresbridge, being thrown up against the Upper Limestone by Brookeborough fault—see section (4). The Tempo River flows over the shales at Drumlone; and they appear in a faulted section at Black Lion, near Lisbellaw.

J. R. K.



Section (3) along Clabby-street.

- a. Quartzose Conglomerate (Lower Carboniferous).
- b. Lower Carboniferous Shale.
- c. Lower Limestone.
- d. Drift.
- X Fault.



Section (4) near Brookeborough, showing—

Faults (X), throwing down Yoredale beds (c) against Upper Limestone (d); and the latter against Lower Carboniferous Shales (a). (b.) Lower Limestone

## LOWER CARBONIFEROUS LIMESTONE.

The lowest beds of this rock seen at the Enniskillen Workhouse are much broken up. The mass appears to be contorted and traversed by innumerable veins of carbonate of lime; it is a hard, tough, highly crystalline and fossiliferous bluish grey limestone.

It appears to dip from the centre of the map in all directions.

A few hundred yards further west on the north shore and almost directly under Derrygore house the rock crops out and here the bedding is very even, with slight shale partings.

The beds are nearly horizontal, dipping very slightly to the south-east at 3°.

The limestone extends for some distance on the other side of Lough Erne and will be described with the Explanatory Memoir of Sheet 44.

S. B. W.

Between Maguiresbridge and Fivemiletown, though the openings are numerous in the middle of the area occupied by this member, no deep sections are laid open. The chief evidence of the nature of the rock is obtained between Greenhill and Brookeborough, at Snowfield, in Cleffany, N. of Colebrooke, and near Clabby; by which it is seen to consist of light, dark, and bluish grey, and blue limestone; as a rule fossiliferous, pure, and suitable for burning; compact or crystalline, and occurring in beds which vary from 9 inches to 2 feet 6 inches or even 3 feet thick. A fine thick bedded light grey limestone, with corals, forms the top of Creeve Hill (529) about half way between Tempo and Fivemiletown. Near Oldtown Wood, N.W. of Maguiresbridge, a little bedded and concretionary chert occurs in light, grey encrinital limestone. Chert is also found in a quarry of limestone one mile east from the last point, about 300 yards west of the road leading from Maguiresbridge to Tempo.

The ground east of Fivemiletown is much obscured by drift. Blocks of grey limestone, almost *in situ*, are found in a small road cutting near Screeby Lough; a quarry of limestone has been opened (though it is now closed) near Killycorran; and the limestone comes to the surface at two points just outside the last margin of the sheet, N.E. and S.E. of Waterhill, at one of which the rock contains fossils similar to those at Cleffany.

The south-east boundary line is believed to follow a ridge which is generally continuous from Colebrooke by Fivemiletown and Broomhill to Mossfield, known in the locality as "The Long Range."

*Middle Limestone ("Calp").*—The only evidences for the continuation of this member into the district described in these pages, are two openings along the course of a stream flowing towards Maguiresbridge by Aghavea Rectory: one of massive, dark, gray, earthy, fetid limestone, dipping under black shales; and another of coralline earthy limestone near the Lower Limestone boundary, similar to that which characterizes the same horizon in the district to the south of the present one.

*Upper Limestone.*—This member enters from the south, and is brought down against the Lower Limestone at Brookeborough. Both members may be represented in the quarry a quarter of a mile N.W. of the town through which the fault passes disturbing the beds greatly. Upper Limestone is also seen in Gallybog near the E. margin, bedding vertical; and in the streams which cross the wedge-shaped outcrop of this member, lying between the two faults which form the ridge running S.W. from Crocknahull. Section Frontispiece, p. 2.

The rock consists of bluish and dark gray limestones with corals and chert, and black fetid limestone; accompanied by a few grit beds, and pyritous shales, containing thin bands and nodules of earthy fossiliferous limestone.

South-west of Alderwood, limestone has been quarried on the hill side, where it is now no longer visible: but near to the same place, a curious section is met with in the townland of Longfield, which, though evidently the limestone is not *in situ*, is confirmatory of its existence in the immediate locality.

Gray crystalline and compact limestone is also seen a mile W. of Cooneen, near "The Green," dipping under shales which are exposed in the S. bank of the Colebrooke River, a short distance S.W. of Pollboy bridge.

A considerable thickness of Upper Limestone, containing a large proportion of shale and arenaceous beds, is brought up against Yoredale grits by the Jenkin Lough fault, S.E. of Cooneen. Fossils (Encrinites, &c.) and chert, both concretionary and bedded, are of frequent occurrence in the limestone and shale.

*Yoredale beds.*—The rocks forming the hilly tract in the S.E. corner, consist of pale or yellow grits, massive and sometimes flaggy; interbedded with shales containing thin limestone bands and clay ironstone nodules, also thin-bedded grey and greenish grits, which are sometimes calcareous, and contain mica flakes.

The pale massive sandstone which forms the summit of the escarpment running S.E. from Brookeborough overlies a section laid open in the Deerpark, south of that town. This section shows blue shale, containing thin beds of earthy limestone with iron pyrites, passing down into purple shale and sandstone with ripple marks. Blue shale occurs in the middle of the Deerpark, dipping towards, and doubtless under, the above section, and seems to overlie flaggy and massive grits seen in the S. W. corner; here a stream lays open a section in which the massive sandstone rests upon blue shale, with calcareous grey sandstone, which is again replaced by pale and dark grey sandstone, before the Upper Limestone boundary is reached.

In a limited area to the S. E. of Cooneen there seems to be a preponderance of shale, &c., over the pale grits, in the aggregate. These beds strike across the valley and underlie the massive grits seen on the hillside near the county boundary in Crocknagrally. A band of shale about Jenkin hill, overlying Upper Limestone, and striking northward, is brought up against Yoredale grits by Jenkin Lough fault.

Thin lenticular patches of coal occur in the Yoredale beds; one of which, of larger dimensions than usual, was worked out previous to my visit in 1878, at an extravagant cost by Capt. H. Brooke. This seam was discovered in the bank of Altogoaghan burn, near Cooneen, and by report was about 5 or 6 inches thick in the middle, and two yards long in section or thereabouts.\*

J. R. K.

### POST PLIOCENE OR DRIFT DEPOSITS.

A large portion of the country is covered with a deep coating of boulder clay. It appears to be much thinner on the higher ground to the E. of Enniskillen; but even there deep banks are very frequent.

On the lower ground the promontories of Lough Erne are formed of boulder clay, and all these hills have a tendency (in some districts well marked) to trend in a north-westerly direction, which also is the direction of the valley of the Erne.

The boulders and pebbles are composed principally of sandstone and conglomerate, with a large quantity of rotten blocks of basalt. South of Enniskillen limestone boulders predominate and show well marked ice striæ in their surface. There are large tracts of peat bog particularly north and north-east of Enniskillen, while the alluvial flats cover a large extent of ground in the valley of the Erne.

S. B. W.

A thin covering of drift conceals the rock along the valley by Fivemiletown; and extends over part of the Yoredale area S.E. of Colebrooke, and northward over the Lower Carboniferous ground east of Glengesh. The rock is laid bare in several places along the streams draining the low ground, and on the hill tops at Cleffany and Creeve.

The drift chiefly consists of tough bluish dark grey or brown clay with scratched boulders and fragments of limestone; other varieties of rock are also noticed in the boulder clay: rounded pebbles of quartz, and quartzite, of pale and purple grits, mingled with the pebbles of limestone in variable proportions. Occasionally the drift consists of tough reddish clay, as in the river banks at the east corner of Colebrooke demesne, and at Oldtown Wood, N.W. of Maguiresbridge, containing in the latter cutting, rounded flaggy purple sandstones, and blocks of greenish grey grits and limestones. Generally, the contents assimilate in character to the subjacent rock: thus, the boulders in the drift covering the small area near Cooneen are chiefly from the pale Yoredale grit.

The ridge already referred to, known as the Long Range, consists of linear hills of drift gravel running from Colebrook by Fivemiletown. Pits have been opened at various points along it.

\*I have been assured by Capt. Brooke himself, that the coal was excellent, he having obtained and burnt a basketful, and that the seam was 18 inches thick, which probably included the adjacent black shale.

In one, near Corralongford mill, the gravel contains numerous dark grey limestone boulders, which have been dug out for burning. On the roadside in Gortmore, and behind Kiltermon church, one and two miles east of Fivemiletown respectively, openings on the ridge show rounded pebbles of pale and purple sandstone, sub-angular fragments of limestone, and white quartz, with boulders of limestone, and a few of basalt of small size.

*Alluvium*.—The tributary of the Colebrooke River, flowing through Corralongford Lough, overflows much of the flat land S.E. of Fivemiletown in wet seasons, yet the alluvium seems to be of slight thickness, except perhaps along the course of the stream in some parts. The alluvial flat at Aghintain is well drained, and the watercourses kept cleared, so that flooding seldom now occurs to any extent. Several smaller flats are met with amongst the drift hills, none of which demand particular attention.

*Peat (bog)*.—A large tract of mountain bog stretches from the low ground at Imeroo, north-eastward, covering almost the whole area of the Lower Carboniferous conglomerate, and sending tongues down the Old Red Sandstone slopes, beyond Tattymoyle, in the N.E. corner. A thin covering of bog lies upon the high ground around Jenkin Hill, which supplies peat to the neighbourhood of Cooneen. Several areas of flat bog occur in the low ground W. of Fivemiletown, which occupy the sites doubtless of former lakes, whose waters have been gradually displaced by the growth of moss, reeds, &c. In other instances however, the vegetable matter must have accumulated around springs, for the shape of the ground, and considerations of drainage, preclude the supposition there, of the former existence of lakes.

J. R. K.

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#### IGNEOUS ROCKS.

*Irvinestown dyke*.—At the north-west margin of the sheet, where the Bundoran railway leaves it, a large dyke of dolerite, a continuation of the Irvinestown dyke, appears. It is seen again a little further east at Cabragh, and again a very similar rock appears about three miles eastward which is probably the same dyke. It is about 25 to 35 yards wide, and weathers in a very peculiar way; in some places there is evidence of its being slightly columnar in formation. It is highly crystalline greenish grey rock formed of augite and felspar, the crystals being large; it weathers into nodules, which when exposed to the air have a dark ferruginous look and under the hammer peel off in flakes. It is very possible that this dyke is the same as that observed by Mr. Kilroe north of Aghintain Castle.

A little north of Killadeas on the margin of sheet a small portion of a large dyke traceable for some distance in a N.W. direction appears. There is not more than 100 yards of it in this sheet however, and its width is about 40 yards. It consists of a dark green diorite of globular structure and appears to be



weathering rapidly. At the engine shed the cutting E. of Ennis-killen there is a small dyke of similar rock, about four yards wide, it is not seen any where else being covered by deep drift.

S. B. W.

The larger dyke traceable from near Clogher by Killyfaddy westward, enters the sheet about a mile north of Lislane at the east margin, and appears at several points along the mountain top towards Tattymoyle hill, until, running down into the Glennamuck valley, it is last seen in the burn flowing under Lendrum's bridge, where it disappears beneath the mountain bog—perhaps also beneath the rock underlying the peat, inasmuch as it has not been discovered on the east side of the great break running through Glengesh and by the Barr: this is the case in other instances, referred to below, and known elsewhere. A very similar dyke traceable by Trillick to Lower Lough Erne,\* first appears a little north of Dooneen hill, west side of Glengesh fault, which may possibly be the continuation across the fault of that above described; for, as Portlock remarks,† its course is waved.

The width of the dyke in Lislane is about thirty yards, elsewhere it is inascertainable, but is scarcely less. It consists of dark grey coarsely crystalline dolerite, shows a rudely columnar structure, and on exposure to the weather, decrepitates at certain points into roundish fragments.

No fewer than six small dykes, running generally N.W., of compact vesicular dark bluish grey basalt cross the Manyburns N. of Clabby, the largest of which (about twelve yards wide on the hill top at Killygordon, though much less in the Manyburns) may be traced from the mountain road east of Glengesh, near the county boundary, south-eastwards for two miles; perhaps as far as the county boundary on the road side about two miles E. of Clabby where is noticed an assemblage of large dolerite blocks. A dyke of dark grey basalt crosses Ballyness burn, and seems to disappear, for it could not be found in burns east or west; another instance of a similar disappearance is met with a mile north of Murley bridge, in the westerly branch of the three into which the Blackwater there divides. A dyke about nine yards wide of dark bluish grey basalt is seen at Rafintan schoohouse half a mile north of Colebrooke demesne, with rudely columnar structure; vesicular near the walls; and a similar one is seen nearly a mile N. E. of Tempo, inside the wall of Tempo demesne, where a burn passes under the road to join the Tempo river. A somewhat exceptional occurrence of dark greenish basalt is met with near the bridge at Cooneen, where the plains of cooling dip generally in accordance with the massive grits at the bridge; neither junction is visible, but it seems as if the basalt were interbedded, or intruded between the Carboniferous beds of the locality. Other smaller dykes are met with, none of which demand special reference.

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\* This dyke is shown on Griffith's map.

† "Report on Londonderry and Tyrone" p. 496.

*Felstone.*—A small outcrop of dark purple, greenish and brownish felstone is seen around Barr church and parsonage, brought up against Lower Old Red Sandstone (Dingle beds) by a fault on the S.E., and passing under the shaley beds belonging to the same formation on the N.W. It is doubtless one of the contemporaneous traps found in the sheets to the N. and N.E. of the one under description.

J. R. K.

#### PRINCIPAL FAULTS.

The zig-zag fault which is mentioned further on by Mr. Kilroe as running through Glengesh by Tempo is continued along the river valley through Lough Eyes for a little south of Lisbellaw, forming the boundary line between the Upper Silurian conglomerates and the Carboniferous rocks.

The fault appears to bifurcate a little north of Lough Eyes, and forms the northern boundary to the Silurian rocks. The boundary between the Upper and Lower Silurian rocks is slightly disturbed by small faults.

S. B. W.

The evidences for the zig-zag fault running by Tempo through Glengesh are numerous; the bedding along its course being contorted, the rock boundaries strikingly displaced, the Lower Carboniferous beds being found at a lower actual level than the Old Red beds seen on the top of the escarpment directly on the other side of Glengesh, and the escarpment itself, which is well developed and continuous from Tempo to the county mearing, a distance of five miles. At Barr parsonage, a quarry is open on the felstone for road material, where the rock is so highly splintered that it needs no breaking, the chief difficulty being to quarry it on account of its shattered condition. The Tempo fault runs into the felstone mass here, but bends sharp eastward forming an elbow, and again north, along the small wooded glen bounding the lawn on the S. and E; the Old Red grits being found on the opposite bank from the Parsonage, dipping towards the felstone at a high angle.

The Clabby and Aghintain break is also easily traced; it cuts out the yellow Carboniferous grits and some of the quartzose conglomerate beds, at the east margin; crosses the Blackwater burn N. of Cole Bridge, may be seen in the Tattanafinnell and Killygordon burns, also at Clabby, and joins the Tempo fault at Imeroo.

The fault by Brookeborough has been already referred to, throwing the Yoredale beds on the south, down against the Lower Limestone and Lower Carboniferous shale. It forms part of the great break running from the County of Mayo by Lough Allen to Lough Neagh.\* At the E. margin, and at Brookeborough it divides southward: one branch running S.W. by Alderwood, throwing the Yoredale beds down against Upper Limestone, and traceable almost to Ardmoney bridge; the other branch running southward by Nutfield.

\* "Physical Geography and Geology of Ireland," by Professor Hull, LL.D., F.R.S., p. 191.

Another fault passes through the S.E. corner, bringing the shales, indicated there, into juxtaposition with the pale grit, and may be seen half a mile east of Jenkin Hill where it crosses the burn. A mile south east of The Cross, near the south margin also, the beds are almost horizontal on one side of the bridge, and dip at a high angle on the other side, and doubtless determines another point on the same line of fault.

*Minerals*.—Traces of barytes were found a little north of the Ballyness dyke, about a mile and a half from the E. margin. No other minerals were noticed.

J. R. K.

## PALÆONTOLOGICAL NOTES.

## LOCALITIES from which FOSSILS were collected.

| No. of Locality. | County.         | Situation, Geological Formation, and Sheet of 1-inch Map.  |
|------------------|-----------------|--|
| 1                | Fermanagh, 27/2 | LOWER SILURIAN.<br>Townland of Leambreslen; slate quarry a little north west of Lisbellaw ("Upper Silurian" on Map), Lower Silurian; Caradoc, dark gray slate and green micaceous slate.                           |
| 2                | Do., 21/2       | CARBONIFEROUS LIMESTONE.<br>Townland of Cornagrade; quarry close to Enniskillen Workhouse; bluish gray limestone; "Lower Limestone" on Map.  |
| 3                | Do., 21/2       | Townland of Drumnaboor, on road close to Spool Mill, Enniskillen; dark gray shale; "Lower Limestone" on Map.   |
| 4                | Do., . . .      | About one mile east of Enniskillen on Dundalk and Enniskillen Railway; dark gray limestone and earthy shale; "Lower Limestone" on Map.   |
| 5                | Do., 22/3       | Townland Tonystick, on road close to Railway, a little east of Enniskillen; dark gray compact limestone and shale; "Lower Limestone" on Map.   |
| 6                | Do., . . .      | Ashford, about one mile and a half south of Lisbellaw; buff coloured sandstone; "Lower Limestone" on Map.  |
| 7                | Do., . . .      | About three miles north-east of Maguire's Bridge, Colebrooke River, west side, a little south of Littlemount Bridge; dark gray limestone and shale; "Lower Limestone" on Map.                                      |
| 8                | Do., . . .      | By Stream, Many Burn's Bridge, on road from Tempo to Clabby, about one and a half miles south of Shawn's Hill; dark gray shales, overlying micaceous sandstone and arenaceous limestone; "Lower Limestone" on Map. |
| 9                | Do., . . .      | About half a mile south of Mullaghssillogagh House, quarries, one and a half miles east of Clabby; compact gray limestone "Lower Limestone" on Map.  |
| 10               | Do., . . .      | A little north of Mullaghssillogagh House, one mile and a half north-east of Clabby; gray shales; "Lower Limestone" on Map.  |

## CATALOGUE of the FOSSILS collected from the LOCALITIES mentioned in the preceding LIST.

The numbers opposite each species refer to the places at which they were collected, and the mark × placed before them denotes their comparative abundance.

## LOWER SILURIAN—CARADOC-BALA AGE.

## Localities.

*Echinodermata.*

*Poterioceras approximatum* (*Gomphoceras sub-fusiforme*  
Portlock's Report, p. 38.) . . . . . 1.

*Graptolitida.*

## Localities.

|                                 |                     |
|---------------------------------|---------------------|
| Diplograptus folium, . . . . .  | 1. Llan.            |
| " pristis, . . . . .            | 1. Llan.            |
| Graptolithus priodon, . . . . . | 1. Carad.           |
| " Sedgwickii, . . . . .         | 1. Llan. and Carad. |

*Annelida.*

Tracks of Marine Worms (Aphrodita, Portlock, p. 362.)

*Lamellibranchiata.*

|  |               |
|--|---------------|
| Mytilus cinctus, abundant according to Portlock, in        |               |
| Lisbellaw schists, . . . . .                               | × × 1. Carad. |
| Cardiola semi-rugata, Portlock's Report, p. 430, . . . . . | 1. Carad.     |

## CARBONIFEROUS LIMESTONE.

*Plantæ.*

|   |    |
|---|----|
| Fucoidal markings, . . . . .                                | 4. |
| Plant fragments, bifurcating and branching stems, . . . . . | 8. |

ACTINOZOA: *Zoantharia.*

|  |              |
|--|--------------|
| Chætetes tumidus, . . . . .                  | 5.           |
| Cyathophyllum ceratites, . . . . .           | × × × 3, 4.  |
| Lithodendron affinis, . . . . .              | 9.           |
| Michelinea favosa, . . . . .                 | 10.          |
| Syringopora geniculata, . . . . .            | 9.           |
| " young (Aulopora serpens, M'Coy), . . . . . | 10.          |
| Zaphrentis cylindrica, . . . . .             | 10.          |
| Zaphrentis or Cyathophyllum, . . . . .       | 6, 7, 9, 10. |

*Polyzoa.*

|   |              |
|---|--------------|
| Fenestella antiqua (F. plebeia, M'Coy), . . . . . | 2, 4, 5, 10. |
| " membranacea, . . . . .                          | 6.           |
| " tenuifila, . . . . .                            | 7, 10.       |

*Brachiopoda.*

|                                       |                       |
|---------------------------------------|-----------------------|
| Athyris planosulcata, . . . . .       | 2, 3, 4, 5, 6, 7, 10. |
| " Royssii, . . . . .                  | 2.                    |
| Chonetes Hardrensis, . . . . .        | 3, 5, 10.             |
| " papilionacea, . . . . .             | 5, × 6, 7, 10.        |
| Lingula squamiformis, . . . . .       | × 8.                  |
| Orthis Michelini, . . . . .           | 10.                   |
| " resupinata, . . . . .               | 2, 3, 7.              |
| Productus giganteus, . . . . .        | × 2, 4, 5, 8.         |
| " punctatus, . . . . .                | 2.                    |
| " pustulosus, . . . . .               | 7.                    |
| " scabriculus, . . . . .              | 2, 5, × 7.            |
| " semireticulatus, . . . . .          | 2, 4, 5, 7, 10.       |
| Rhynchonella acuminata, . . . . .     | 2.                    |
| " pleurodon, . . . . .                | × 10.                 |
| " pugnus, . . . . .                   | 2.                    |
| Spirifera bisulcata, . . . . .        | 2.                    |
| " cuspidata, . . . . .                | 2.                    |
| " glabra, . . . . .                   | 2.                    |
| " striata, . . . . .                  | 2, 4, 5, 6, 7.        |
| Spiriferina cristata, . . . . .       | 4, 7, 10.             |
| Streptorhynchus crenistria, . . . . . | 2, 4, × 6, 10.        |
| Strophomena analoga, . . . . .        | 7.                    |
| Terebratulula hastata, . . . . .      | 9, 10.                |

*Lamellibranchiata.*

|                                      |      |
|--------------------------------------|------|
| Aviculopecten Forbesii, . . . . .    | × 5. |
| " sp. indet., . . . . .              | 10.  |
| Pleurorhynchus fusiformis, . . . . . | 10.  |

*Gasteropoda.*

|                                     |    |
|-------------------------------------|----|
| Euomphalus crotalostomus, . . . . . | 2. |
|-------------------------------------|----|

| <i>Heteropoda.</i>              |   |   |   |   | Localities.                                       |
|---------------------------------|---|---|---|---|---|
| Bellerophon apertus,            | . | . | . | . | 9.  |
| " cornu-arietis,                | . | . | . | . | 2.  |
| " hiulcus,                      | . | . | . | . | 2.  |
| <i>Cephalopoda.</i>             |   |   |   |   |   |
| Nautilus biangulatus            | . | . | . | . | 2.  |
| <i>Crinoidea.</i>               |   |   |   |   |   |
| Actinocrinus lævis              | . | . | . | . | × 2.  |
| " sp. indet.,                   | . | . | . | . | 3, 6.   |
| Archæocidaris vetusta,          | . | . | . | . | 2.  |
| Poteriocrinus crassus,          | . | . | . | . | 7.  |
| Rhodocrinus,                    | . | . | . | . | 2.  |
| Crinoid stems and joints,       | . | . | . | . | × × 2, × × 3, × × × 4, × × 5,<br>× × 6, 7, 9, 10. |
| CRUSTACEA: <i>Entomostraca.</i> |   |   |   |   |   |
| Leperditia Okeni,               | . | . | . | . | 5, × 8, 10.                                       |
| <i>Trilobita.</i>               |   |   |   |   |   |
| Phillipsia Derbiensis,          | . | . | . | . | 10.   |
| " pustulata,                    | . | . | . | . | 3.  |

#### REMARKS ON THE FOSSILS.

The fossils from the Silurian rocks at Lisbellaw are described in Portlock's Report as marking the deposit as "a more recent stage of the Silurian system than that of Tyrone." In the explanation to sheet 34 which includes the Pomeroy district, p. 24, &c., the fossils are described, (as they have usually been by Murchison and others) as characterizing Lower Silurian strata of Caradoc-Bala age. The fossils of the Lisbellaw slates, although much fewer in numbers, also appear to me characteristic forms indicating strata of a similar age.

The fossils from the Carboniferous series were not especially numerous or remarkable; at the large quarry near Enniskillen Workhouse (locality No. 2) a very large Bellerophon, *B. cornu-arietis* with several other species were named by me from the collection of Mr. Thomas Plunkett, M.R.I.A., to whom I am also indebted for valuable assistance whilst visiting the fossil localities on this sheet. At Ashford (locality 6) a little south of Lisbellaw, the rock is a buff coloured sandstone containing casts of several species of Carboniferous Brachiopods, &c. At (loc. 8) Many Burns Bridge, from dark grey shales overlying sandstone in which the shells had become decomposed, the cavities being filled with crystals of carbonate of lime, the fossils were the small Entomostracan Crustacean *Leperditia Okeni* also occurring at localities 5 and 10, and the Brachiopod shell, *Lingula squamiformis* associated with branching stems of plants. No fossils were observed in the rocks described as "Yoredale beds" in this sheet of the map.

WILLIAM HELLIER BAILY.

September 29th, 1881.

# INDEX.

- Aghaves Rectory, 15.  
 Alderwood, 16, 20.  
 Alluvium and Peat (bog), 8, 18.  
 Altogoahan burn, 17.  
 Aghintain, 8, 12, 18.  
     " castle, 13, 18.  
     " fault, 20.  
 Ashbrooke, 8.  
 Ashfield, 9.  
 Augher, 8.  
 Ballinamallard, 7.  
     " river, 11.  
 Ballycassidy, 7.  
     " bridge, 10.  
 Ballyness burn, 13, 19.  
     " dyke, 21.  
     " mountain, 8.  
 Barr, 19.  
     " church, 20.  
 Barytes, traces of, 21.  
 Basalt, 9.  
 Belmore mountain, 7.  
 Black Lion, 14.  
 Blackwater river, 8, 19, 20.  
 Boulder clay and gravel, 8.  
 Brocker mountain, 8, 12, 7.  
     " felspathic conglomerates of, 11.  
 Brookeborough, 7, 8, 15, 16, 20.  
     " deer park, 16.  
     " fault, 14, 20.  
 Broomhill, 15.  
 Bundoran Junction, 11.  
 Cabragh, 18.  
 Calciferous series of Scotland, 13.  
 Castle Coole, 10.  
 Chert, 15.  
 Clabby, 8, 12, 14, 15, 19.  
     " fault, 20.  
 Cleffany, 15, 17.  
 Clogher, 8, 19.  
 Cole bridge, 13, 20.  
 Colebrooke, 8, 15.  
     " river, 8, 16, 18.  
     " demesne, 17, 19.  
 Cooneen, 16, 17, 18, 19.  
     " valley, 8.  
     " water, 8.  
 Corralongford lough, 14, 18.  
     " mill, 18.  
 Creaghnamoney hill, 11.  
 Creeve, 17.  
     " hill, 15.  
 Crocknagrally, 16.  
 Crocknahull, 16.  
 Culcagh, 7.  
 Derrygore house, 15.  
 "Dingle beds," 12, 20.  
 Dolerite, 9.  
 Donaghey's bridge, 12.  
 Donaghmore glen, 8.  
 Donegal, 10.  
 Doonsen hill, 19.  
 Drift deposits, 17.  
 Dromore lower, 11, 12.  
 Drumgay lough, 10.  
 Drumlone, 14.  
 Enniskillen, 7, 10, 17, 19.  
     " workhouse, 15.  
 Faults, 9, 20.  
 Felstone, 20.  
 Fintona, 8.  
 Fivemiletown, 7, 8, 13, 14, 15, 17, 18.  
 Formations and groups of rocks entering  
     into the structure of the district, 8.  
 Gallybog, 16.  
 General description, 7.  
 Glengesh, 8, 17, 19, 20.  
 Glennamuck river, 8, 11.  
     " valley, 19.  
 Glenoo river, 8, 11.  
 Gortmore, 18.  
 Greenhill, 15.  
 Griffith, Sir R., 13.  
 Igneous rocks, 9, 18.  
 Imeroo, 18, 20.  
 Irvinestown dyke, 18.  
 Jenkin hill, 8, 18, 21.  
 Jenkin lough fault, 16, 21.  
 Killadeas, 18.  
 Killycorran, 15.  
 Killyfaddy, 19.  
 Killygordan, 19.  
     " burn, 20.  
 Kiltermon Church, 14, 18.  
 Knockninny, 7.  
 Lendrum's bridge, 12, 19.  
 Limestone, lower carboniferous, 15.  
     " upper, 16.  
 Lisbellaw, 7, 9, 10.  
     " station, 9.  
 Lislane, 19.  
 Llandeilo slates, 9.  
 Longfield, 16.  
 "Long Range," 17.  
 Lough Allen, 20.  
     " Erne, 7, 15, 17.  
     " Eyes, 10, 20.  
     " valley, 12.  
     " Gola, 12.  
     " Macnean, 7.  
     " Neagh, 20.  
 Lower carboniferous limestone, 15.

Lower carboniferous sandstone, 8.  
 " " " and shale, 12  
 " " shale, 8.  
 " limestone, 8.  
 " Lough Erne, 7, 19.  
 " Old red sandstone ("Dingle beds")  
 8, 10.  
 " Palæozoic formations, 9.  
 " Silurian beds, 9.

Maguiresbridge, 7, 8, 15, 17.  
 Manyburns river, 8, 19.  
 Mayo, county of, 20.  
 Middle limestone ("calp"), 8, 15.  
 Minerals, 21.  
 Mossfield, 15.  
 Murley, 8.  
 " bridge, 19.

Necarne castle, 7.  
 Nutfield, 20.

Old red sandstone, lower, 10  
 Oldtown wood, 15, 17

Palæontological notes, 2.  
 Peat bog, 18.  
 Physical geography, 7, 8.  
 Pollboy bridge, 16.  
 Portlock, Gen. Report on Londonderry  
 &c., 10, 11, 13, 19.  
 Post-pliocene or drift deposits, 17.  
 Principal faults, 20.

Quartzose conglomerates in lower carboni-  
 ferous, 12, 13.  
 " " in lower silurian, 9

Rafintan schoolhouse, 19.  
 Raindrop pittings, 12.  
 Remarks on fossils, 23.  
 Ripple marks in Yoredale bed 16.  
 Rossfad house, 10.

Sandstone, lower carboniferous, 12.

Screaby lough, 15.  
 Shale, lower carboniferous, 12.  
 Sketch, showing section along Clabby-street,  
 14.  
 " " " in Tattanafinnell  
 burn, 13.  
 " " near Brookeborough,  
 14.  
 through Lisbellaw,  
 to illustrate the  
 succession and the  
 relations of the  
 formations, 10.

Slieve hill, 9.  
 Snowfield, 15.  
 "Sun cracks," 12.  
 Swanlinbar, 7.

Tamlaght church, 10.  
 Tattanafinnell burn, 20.  
 Tattymoyle hill, 8, 13, 18, 19.  
 Teige's mountain, 8.  
 Tempo, 7, 8, 10, 11, 15, 19, 20  
 " river, 8, 10, 14.  
 The "Cross," 21.  
 " "Green," 16.  
 " "Long range," 15.  
 Thornoge, 7.  
 Three Jump hill, 9.  
 Topped mountain, 7, 11  
 Trillick, 7, 19.  
 Tullyrain bridge, 11.  
 Tullyullagh, 14.

Upper limestone, 8, 16.  
 " Llandovery conglomerates, 9.  
 " Lough Erne, 7.  
 " Silurian beds, 9.

Waterhill, 15.

Yoredale grit, 16.  
 " sandstone, 8.  
 " shale, 8.

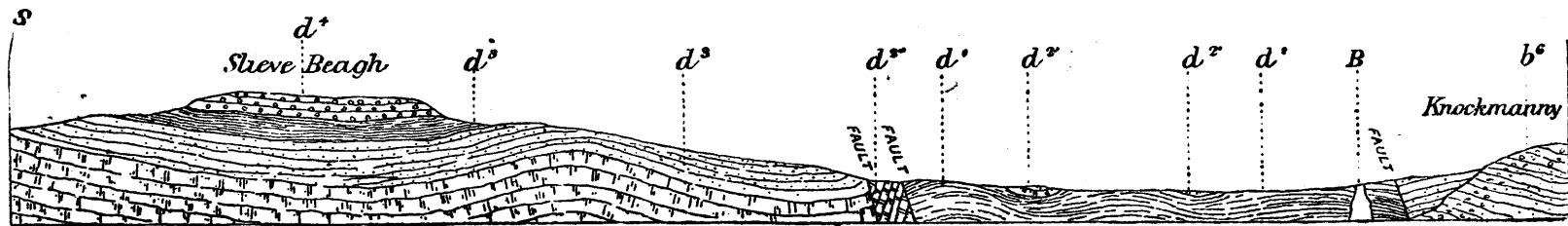
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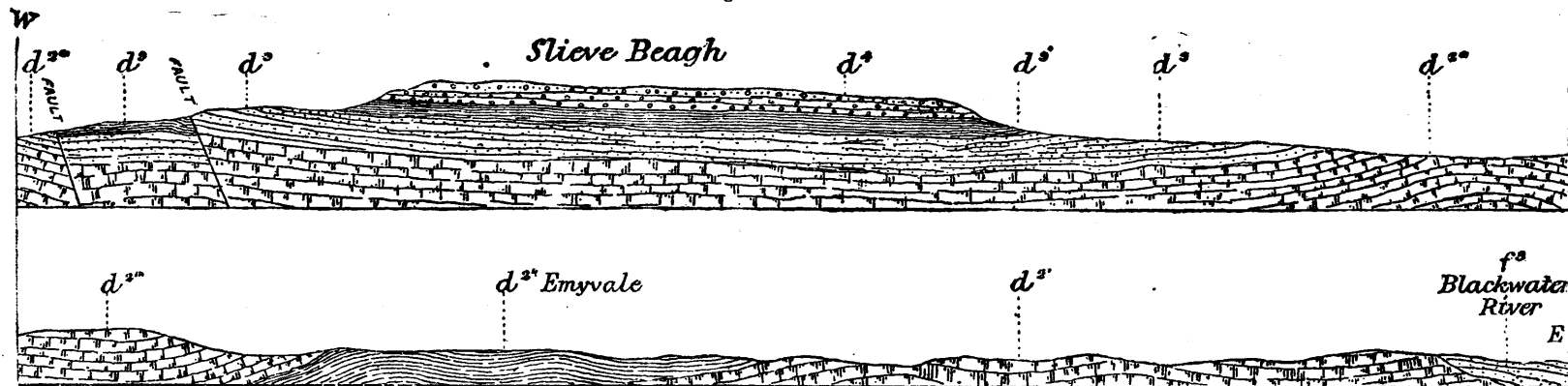
[P 134.—250. 3. 82.]



Section 1 from Slieve Beagh to Knockmannry. Distance  $8\frac{1}{2}$  miles.



Section 2 across Slieve Beagh to Blackwater River. Distance 17 miles.



$b^3$  Dingle Beds.

$d^1$  Lower Carboniferous Beds.

$d^{2'}$  Lower Limestones.

$a^{2''}$  Middle Limestones.

$a^{2'''}$  Upper Limestone.

$a^3$  Yoredale Sandstone.

$d^{3'}$  Yoredale Shale.

$d^4$  Millstone Grit.